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G V L F

M E X I C O

The Military Mission

Implicit in the very being of the Corps of Engineers is its military mission. Initially a by-product of the nation's earliest wartime struggles, the Corps has served in a dual capacity for many years. The civil works function continuously discharged by Corps personnel has insured the existence of a contingent of trained engineers who are prepared to make the transition to military duties when the need arises. The flexibility required to abruptly shift gears and move swiftly from civil into military construction underlies this organization's history.

The Harbor Defenses of Galveston

One of the principal tasks undertaken by the first West Point engineer officers was construction of seacoast fortifications. Many decades passed, however, before their efforts reached the Texas Gulf Coast. Meanwhile, scattered defensive measures to protect the strategic harbor at Galveston were begun as early as 1816 under Spanish rule and continued through the succeeding regimes of Mexico and the Texas Republic. The military, economic, and political importance of the port was evidenced by a \$300,000 appropriation by Congress in 1856 to erect fortifications in the bay.¹

During the Civil War, Confederate authorities protected Galveston with an extensive system of at least eighteen temporary installations ranging from modest earthworks to more pretentious structures. Designed chiefly to oppose a landing in force, these fortifications were located on the island itself, Bolivar Point, Pelican Spit, and on the mainland at Virginia Point. After the close of hostilities, future Chief of Engineers Brevet Maj. (later Maj. Gen.) G. L. Gillespie surveyed these defenses and filed his map in the Engineer Bureau of the War Department.²

Opposite page: Major Gillespie's map of rebel defenses shows South Battery along Galveston beachfront. Fort Scurry is located at eastern extremity of city, followed by Fort Bankhead, Fort Magruder, and Fort Point. Dark line running south of city indicates line of defensive works. (National Archives)

As army engineers began earnestly surveying Texas harbors, Lt. W. S. Stanton described the vestiges of defensive works at Fort Point:

. . . During the storm of October last [1867], . . . the northern part of the east shore of the island receded about 130 feet; the wharf and all the buildings, three in number, and the case-mated defensive work situated at the northeast corner of the island, were entirely demolished and all their material swept away by the sea. The 42-pounder and the two 32-pounders which formed the armament of the work are now scarcely visible above the surface of the water. A barbette battery formed of sand, and containing one unserviceable 9-inch naval gun, is the only work remaining on the island.

He mentioned Pelican Spit as a potential site for a permanent work if it were protected by breakwaters.³

On February 23, 1876, Chief of Engineers Gen. A. A. Humphreys called upon a board of engineers to plan defenses for Galveston. The growing importance of the port and the desirability of furnishing defenses for Galveston Harbor were becoming obvious. First in 1880, and again in the subsequent years, the sum of \$50,000 was requested for "earthen batteries of heavy guns . . . to be placed on Pelican Spit, Galveston Island, and Bolivar Point . . ." ⁴ The appropriation was never made.

In fact, the problem was considerably more widespread. The coasts of the United States stood largely undefended; those old-style masonry forts that remained were mounted with obsolete ordnance, incapable of coping with the more modern, armored ships that had been introduced. Growing concern over adequate coastal defense prompted the president, under an act dated March 3, 1885, to appoint a Board on Fortifications and Other Defenses. Popularly known as the Endicott Board, this body published a report in 1886 which gave rise to a new system of seacoast defenses including manufacture of up-to-date ordnance, construction of gun and mortar batteries, and torpedo defenses. The original plans provided for twenty-seven principal ports among which Galveston ranked seventeenth in order of urgency. Manufacture of modern ordnance, the highest priority, began under an appropriation act approved September 22, 1888. The first appropriation for construction of batteries was made in an act passed August 18, 1890. The board of engineers visited Galveston and examined sites in April of 1895, returning to New York to prepare plans for both artillery and submarine mining defenses.⁵

Galveston Engineer Office personnel added military work to their civil responsibilities for the first time in 1895. Maj. A. M. Miller and Lt. W. V.

Judson turned their attention to the initial fortification work, a mining casemate for torpedo defense, begun with an allotment of \$10,000. This meager allowance demanded such stringent economy that purchase of any mixing plant was out of the question and the concrete had to be made by hand. By June 30, 1897, this casemate had been completed at Fort Point, built at a cost of \$15,009.27. Meanwhile, work was begun on gun and mortar emplacements. On January 12, 1897, an allotment of \$71,000 was made for the purchase of fortification sites. One site was purchased at a price of \$35,000 and negotiations for a second, costing \$36,000, were in progress.⁶

As diplomatic relations with Spain assumed an ominous aspect, national defense was accorded higher priority; orders were issued to push work ahead and mount every available gun with the greatest possible haste. Additional gun emplacements were authorized for Galveston under new national defense appropriations. Capt. Charles S. Riché, then in charge at Galveston, received reinforcements of additional army officers. Lt. Harry Burgess, who had just completed a torpedo course at Willets Point, was ordered to Galveston early in April, 1898. On April 25, Congress declared war against Spain, making the declaration retroactive to April 21.⁷

Lieutenant Burgess directed installation of submarine mining defenses in Galveston Harbor. On April 23, 1898, he laid the cable and began placing mines in the entrance channel and in the Gulf along the beach-front. Burgess was unable to secure a suitable boat for this operation, so the work was accomplished by a makeshift arrangement with the government tug *Anna* towing a derrick barge hired for the purpose. Since the turbulent winds and choppy waters of the Gulf did not discriminate between military and civil undertakings, the motor power of the tug often proved insufficient to handle the barge, thereby delaying the work. The mines were connected by cable to the operating apparatus housed in the shotproof casemate. During the time the harbor was obstructed by mine fields (until August 22, 1898), Galveston Engineer Office personnel patrolled the mines daily, testing them, repairing defects, keeping batteries and operating devices in order, and holding the system ready for immediate service. In July, 1898, they added searchlight facilities to the harbor defenses.⁸

Meanwhile, work continued on the batteries around which grew the three major installations that would safeguard Galveston Island and its harbor over the next fifty years. Situated on a large tract at the east end of the island and named for the deciding battle in the Texas War of Independence, Fort San Jacinto was the first to be garrisoned (on April 20, 1898). This government reservation had been set aside for public purposes by an act of the Republic of Texas dated December 9, 1836 and under joint

SUBJECT: Mining Defense.

Office of the Chief of Engineers,
United States Army,

Washington, April 19, 1898.

1st Lieut. C. L. Riché
Corps of Engs. U.S.A.
Galveston Texas

Sir:

It is desired that you shall at once complete every detail of the mining defense of the harbors under your charge, so far as available materials will admit, except placing the mines in position, and that upon receipt of a telegram from me to "go ahead with mines", you will place the mines in position and complete everything necessary for operating them, as rapidly as possible.

Upon receipt of this letter you are requested to report how soon after the receipt of a telegram the mining defenses under your charge will be ready for service.

Very respectfully,

John M. Wilson

Brig. Gen., Chief of Engineers,

U. S. Army.

Burgess.

Hold up on the mines
Didn't you understand preceding
letter to mean "put 'em in"?
C.S.R.

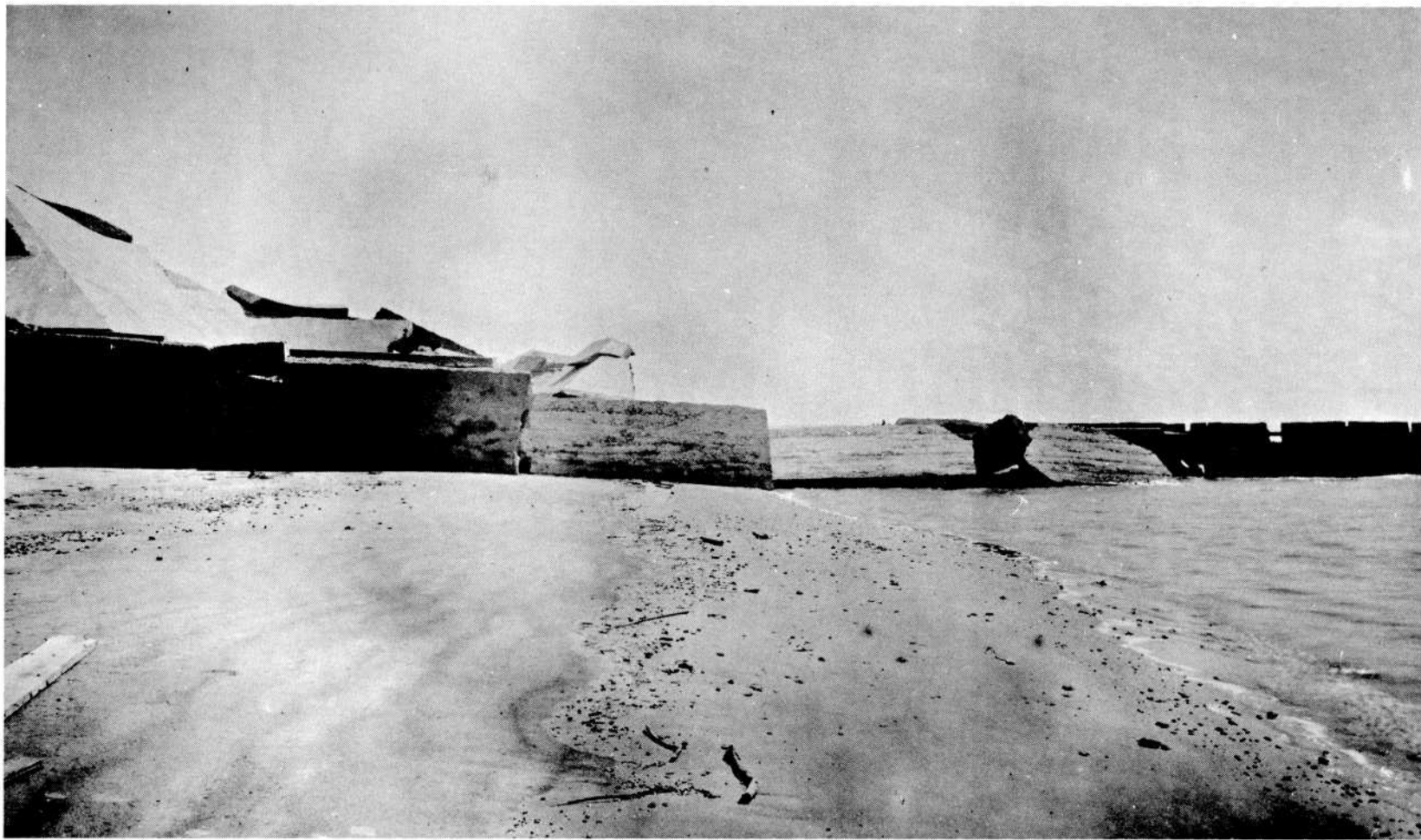
resolution of Congress about the time of annexation. Earlier fortifications in this vicinity had been a Fort Travis, built in 1836, and the later Fort Point and Fort Magruder, of Civil War vintage. The new Fort San Jacinto contained four original batteries, one mining casemate, submarine mining warehouses, cable tanks, and tracks for communication.⁹

As protection for the city, batteries were begun in 1897 along the city beachfront. On January 18, 1897, the United States had purchased for \$35,000 approximately 125 acres (bounded by Forty-fifth Street, Avenue U, Forty-ninth Street, and Avenue W along the waterfront) from the Galveston Land and Improvement Company, a Colorado corporation based in Denver. Through a second transaction on April 17, 1900, the federal government paid the heftier sum of \$126,000 to acquire the adjacent parcel of land from Forty-ninth Street to Fifty-third Street. This property, between Forty-fifth and Fifty-third streets, was named the Fort Crockett Military Reservation in honor of David Crockett, hero of the Alamo. First garrisoned in April, 1899, Fort Crockett contained three original batteries. The third installation, Fort Travis, was located on Bolivar Point, across the channel from Galveston Island. Boasting two batteries, Fort Travis was turned over to the Coast Artillery on October 25, 1899.¹⁰

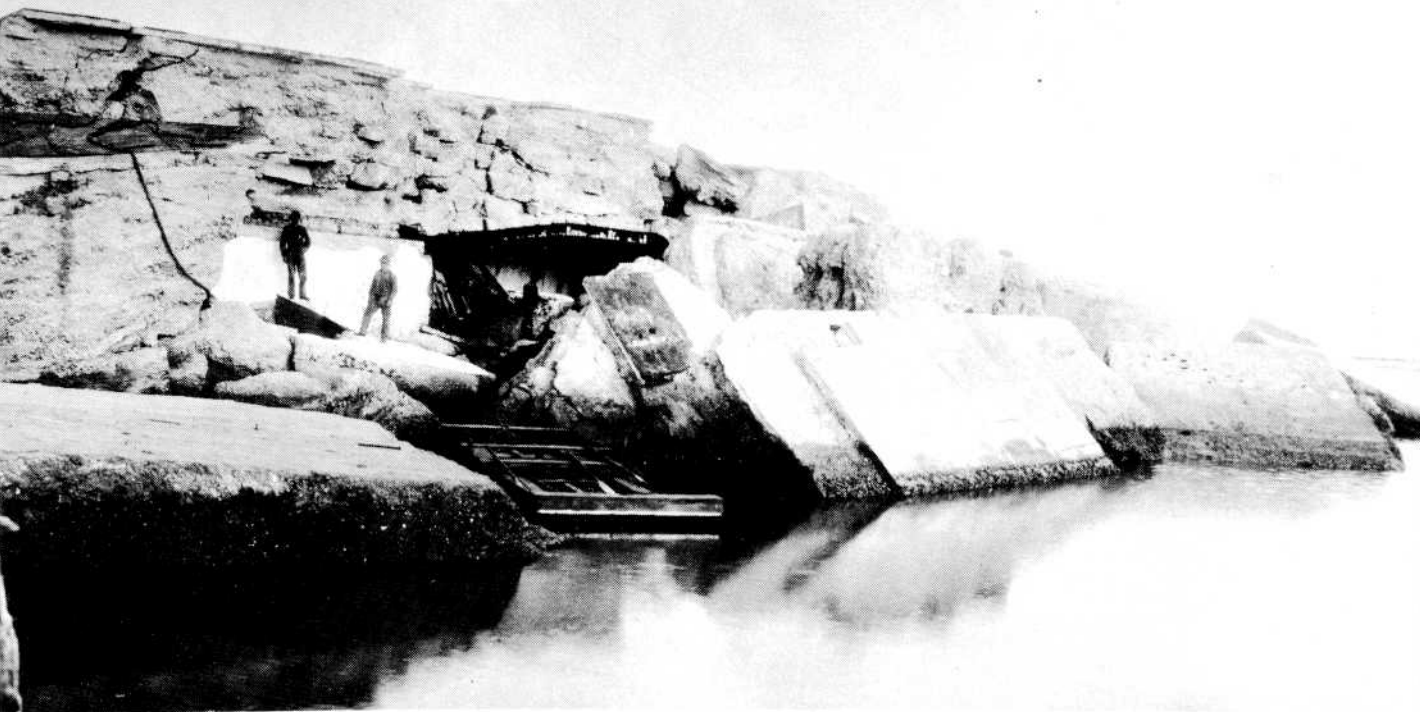
In September of 1900, the terrible storm struck the island that all but obliterated the city of Galveston. As might be expected from their exposed locations along the Gulf, the government fortifications fared little better than the rest of the city. Batteries previously completed and garrisoned were transferred back to the charge of the Engineer Department.¹¹

Col. Henry M. Robert, Maj. H. M. Adams, Captain Riché, and Capt. Edgar Jadwin were appointed to assess the damage. This board met in Galveston from October 22-27, examined the condition of the jetties, the main ship channel, and the fortifications, and decided upon general lines of needed repairs. Drawings and computations were prepared in Galveston under Riché's direction. The officers found the batteries not constructed upon pile foundations damaged beyond repair. Their plan for replacement of those batteries and repair of the others was provided for by a \$992,000 appropriation under an act passed March 1, 1901.¹²

The work of reconstruction and repair was completed by 1906. In 1911, the batteries reverted to the Coast Artillery under command of the coast defense commander at Fort Crockett. This fort quickly gained prominence as a mobilization center for troops to serve at the Mexican border.

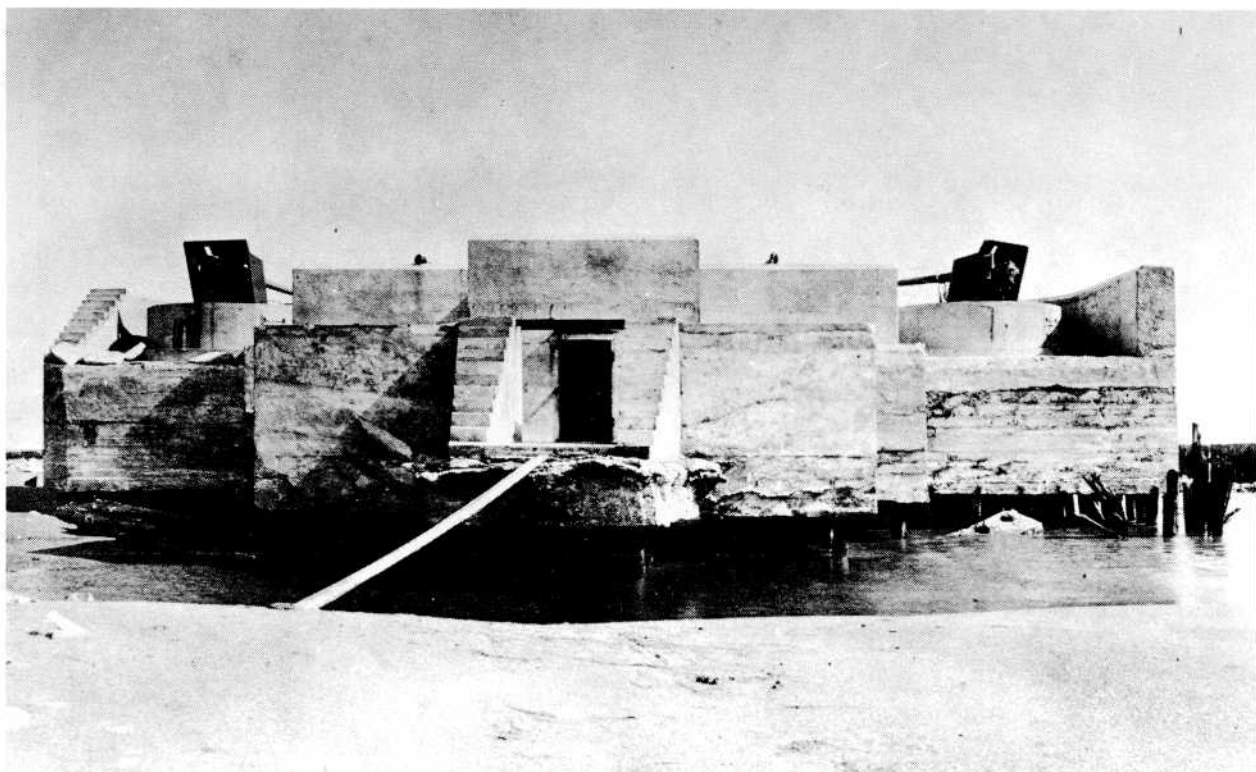


Battery Mercer at Fort San Jacinto, viewed from southwest on September 20, 1900, offers a study in surrealism.



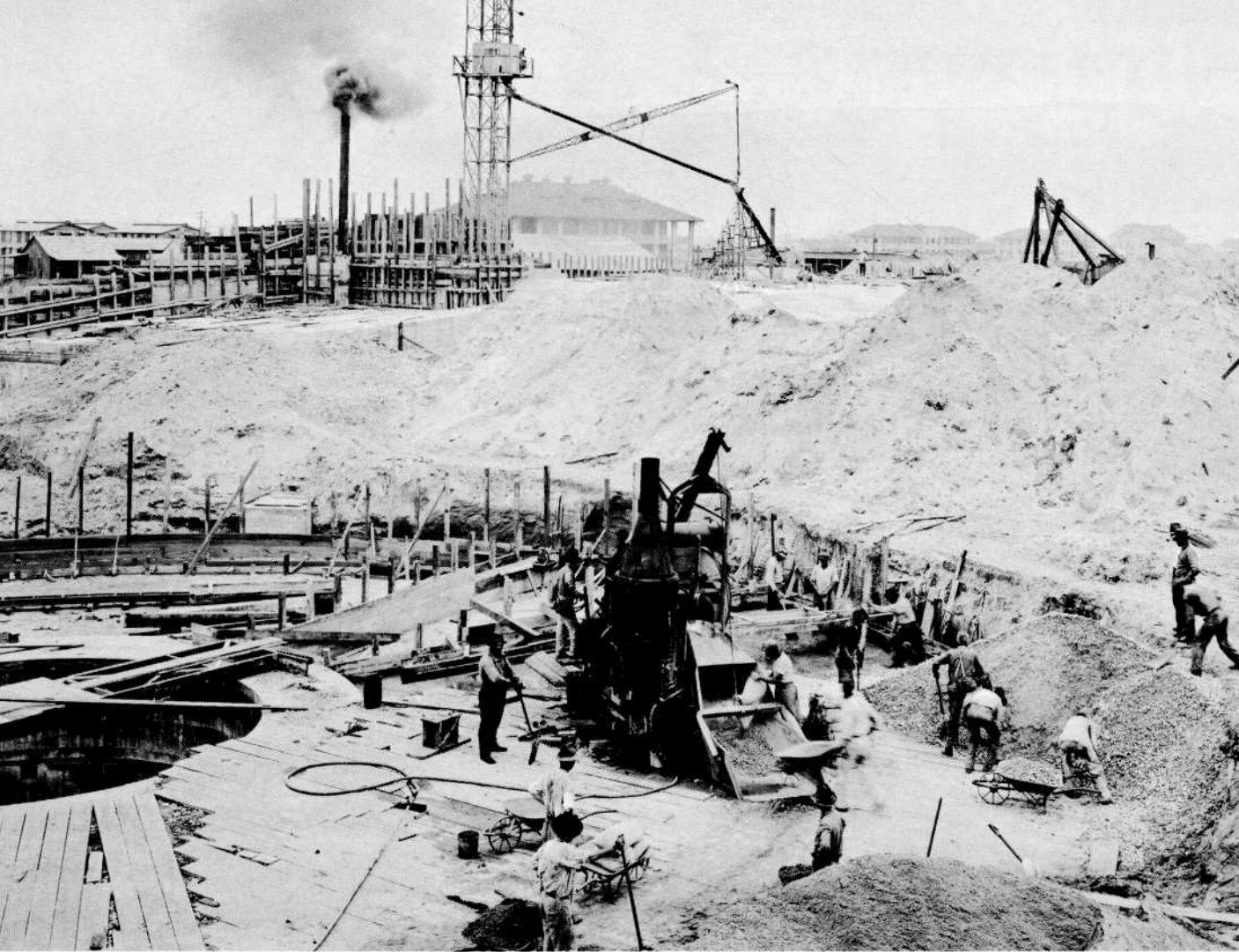
Magazine of Battery Mercer after storm, September 20, 1900

Effects of 1900 storm on Battery Hogan, September 21, 1900





Destruction from storm at Fort San Jacinto's Battery Heileman resembles aftermath of war.



Construction of gun well for 12-inch battery at Fort Crockett, 1918

During World War I, heavy artillery troops for the expeditionary forces received training at Fort Crockett. Trench mortar units, railroad artillery and howitzer organizations, and a steady stream of replacement batteries left the fort for duty overseas. In addition, replacement troops were shipped to France at frequent intervals, toward the latter part of the conflict at a monthly rate of between one hundred and two hundred men. As many as three thousand men are estimated to have been at Fort Crockett at one time during the war.¹³

Galveston army engineers built two new batteries about this time. Battery Hoskins at Fort Crockett was begun in August, 1917 and was turned over to the coast defense commander on May 16, 1921. Cost of the battery ran approximately \$300,000 with an additional \$150,000 for guns and carriage. One year later, Battery Kimble was completed at Fort Travis.¹⁴



Temporary housing at Fort Crockett (Rosenberg Library)

An Unprecedented Challenge

Prior to World War II, the predominant military responsibility of the army engineers had consisted of building fortifications, roads, and bridges, plus other combat-related activities. Although these duties were traditionally assigned to the Corps of Engineers, the function of sheltering troops resided in the Quartermaster Corps. Still other, smaller segments of military construction were performed by the Ordnance Department and the Signal Corps.¹⁵ World War II would change all this.

World War I had offered a taste of what was to come. It had caught the United States completely unprepared for large-scale warfare, setting off a frantic and costly emergency construction program to meet the sudden need for cantonments. But the lessons of World War I went largely unheeded and appropriate steps to avoid future unpreparedness were not carried through. Although the news from Europe in the late 1930s pointed in the direction of another war, mobilization efforts in the United States moved slowly at first.

As the months passed, the country moved toward the brink of war. Once again, the nation was compelled to seriously address itself to the realities of a major military encounter. The unprecedented magnitude of

World War II and technological advances in modern warfare presented a tremendous challenge in military construction. Before an army could be assembled and trained, a vast assortment of reception centers, training camps, and cantonments was essential.

Appropriations were gradually forthcoming as the urgency for construction approached critical proportions. Confronted with a crash construction program, the president and the War Department grappled with the difficult question of where to place responsibility for this vital work. A complicated power struggle ensued between two major contenders, the Quartermaster Corps and the Corps of Engineers.

Veterans of the World War I cantonment program located in the Construction Division of the Quartermaster Corps argued their qualifications on the grounds of previous experience and tradition. Viewing the Quartermaster Corps as specialists in supply, Chief of Engineers Maj. Gen. Julian L. Schley headed an established construction organization staffed with the cream of the crop from West Point as well as graduates of the finest civilian engineering schools. Moreover, the civil works conducted by the Corps of Engineers had begun to dwindle significantly as funds were diverted into larger appropriations for the escalating military work, freeing the engineers to assume new activities.¹⁶

Initially, the Quartermaster Corps undertook the formidable job. Working against monumental odds, the highly centralized Construction Division struggled valiantly to put up housing for National Guard, Regular Army, and Army Air Corps units, as well as airfields and munitions plants. Although it achieved an impressive record of accomplishment, the Construction Division was unequal to the staggering task. Meanwhile, facilitated by the Reorganization Act of April 3, 1939, a series of reorganizations occurred within the War Department that gradually paved the way for eventual transfer of all military construction to the Corps of Engineers.¹⁷

A System of Airfields

Two actions late in 1940 resulted in the first substantial shift of responsibility. Approved October 9, 1940, the First Supplemental Civil Functions Appropriation Act for 1941 provided \$40 million for airport construction by the Civil Aeronautics Authority (CAA). The Corps of Engineers was to perform extensive survey and construction work for CAA. Soon thereafter, on November 19, 1940, construction at all Army Air Corps stations except those in Panama was ordered to be transferred to the army engineers without delay.¹⁸

As the year 1940 drew to its close, Galveston District personnel prepared to plunge into airfield construction throughout the state. They formed two groups, one to tackle CAA projects and the other to take on air corps construction. Working at first out of the Trust Building and after June of 1941 from the Santa Fe Building, these two groups extended their working hours in an effort to meet the demanding set of deadlines facing them. Office hours seven days a week and every evening after supper except on Saturday and Sunday became accepted routine.¹⁹

The CAA scheme provided for a system of airfields to be developed throughout the country. CAA fields would be used for military purposes as long as necessary and turned over to the municipalities furnishing the land when the threat to national defense had subsided. The government held recapture rights for future military use. The initial assignment to the Galveston District called for six fields.

Once a field had been authorized, the engineers studied weather data, scrutinizing wind statistics to determine prevailing direction and range of velocities. Next they sent men into the field to make contour maps on which the CAA runway system would be imposed. Then began the job of designing.

The fourteen men in the CAA group were soon turning out plans for at least one runway, taxiways, and apron areas at the rate of one airfield a week. By the end of March, 1941, the first CAA contract was awarded to

Airfield landing strip construction, World War II





Building barracks for airmen

grade more than a million cubic yards of earth at Sweetwater. Work progressed steadily at other fields located at Corpus Christi, Houston, Waco, Austin, Galveston, Midland, Brownsville, Marfa, Kerrville, Beeville, Beaumont, and Alice. By 1943, the district had supervised construction and/or expansion of municipal airdrome facilities at eighteen CAA airfields costing approximately \$13 million.

Because of the favorable flying weather prevailing in southern and western Texas, this extensive region offered desirable sites for airfields, flying schools, and bombing ranges. Construction of new cantonment areas and airfield facilities at Ellington Field, the first air corps project assigned to the Galveston District, was transferred from the Quartermaster on December 16, 1940. By the end of January, 1941, the district was supervising barracks construction at Ellington, where the Tellepsen Construction Company was requesting authorization for overtime compensation to keep crews on the job ten hours a day, seven days a week. Skilled trades employed at that time included thirty-five electricians, twenty-two plumbers, nine steamfitters, seventy-four painters, four hundred carpenters, ten ironworkers, and fourteen sheet metal workers.²⁰

New air corps construction at existing installations (Brooks, Kelly, Randolph, and Duncan fields) was assigned to the Galveston District eleven days after the Ellington transfer. A field office was established at San Antonio to handle these modifications. The district also took over the completion of housing and technical facilities at Goodfellow Field near San Angelo as part of its early airfield work. By June of 1941, new flying schools had been authorized at Victoria's Foster Field, Mission's Moore Field, and at Harlingen, Waco, and Midland army airfields.

In acquiring the airfield construction, the Corps of Engineers inherited not only the projects themselves, but also the problems that accompanied them. Tremendous flexibility was essential to cope with the rapid volley of directives that incorporated increases in army strength, advances in aviation, shortages in manpower, materials, and equipment, and organizational and procedural changes.

The course of the Ellington Field project illustrates the irregular pace characterizing military construction. The first directive was issued to the Quartermaster Corps on July 29, 1940. Originally, the project called for construction of 182 cantonment buildings to house a bombing training center with accommodations for 2,979 enlisted men, 265 officers, and 610 cadets. Contractors began construction on September 12, 1940 for an estimated \$3,969,000. By the end of 1942, the capacity at Ellington Field had been increased to 8,250 men and the cost had risen to \$11,042,000.²¹

Dating back to World War I, Ellington Field was a turfed, allover flying field hampered by slow surface drainage. Lightweight aircraft could operate on the field under dry conditions only. As late as November 29, 1940, an inspector reported:

The repair of existing subsoil drains, deepening of the canals and improvement of field drainage into the deepened canals appear to be considered by the Office of the Chief of Air Corps as adequate preparation of the field for flying operations. That office states that paved runways will not be constructed.²²

Within two months, Galveston District Engineer Maj. (later Col.) Leland Hazelton Hewitt, was corresponding with the Portland Cement Association, comparing various types of pavement for what would become the largest medium bomber training base in the country, covering 1,192 acres with a total paved area of 990,794 square yards.²³

Major Hewitt was one of several graduates of the two West Point classes of 1918 who directed Galveston activities during the war years. He had followed his graduation in June, 1918 with postgraduate training at

the Camp Humphreys (later Fort Belvoir) Engineer School and Massachusetts Institute of Technology, from which he earned a B.S. degree in civil engineering. Hewitt was assigned to Galveston in the summer of 1939 and became district engineer on January 13, 1941, soon after the transfer of airfield construction. He led the district through the wildest months of war construction, leaving in December of 1942 to serve in Australia and the Philippines. Later he was appointed chief engineer of the Far East Air Force on General MacArthur's staff. After his retirement from the army in 1954, he was named United States Commissioner of the International Boundary and Water Commission, United States and Mexico.²⁴

Shortly after the airfield transfer, Maj. (later Col.) David Wood Griffiths was ordered to Galveston to assist Hewitt. An exceptional student, Griffiths had graduated first in his November, 1918 class at West Point. Among his classmates had been Leslie R. Groves, the Galveston District alumnus who occupied a prominent position in the Construction Division of the Quartermaster Corps prior to the U.S. entry into World War II and later headed the vital Manhattan Project. The newly commissioned Griffiths was ordered to attend the civil engineering course at Camp Humphreys. Overcoming deficiencies in transportation between Washington and the camp, he arrived along with several of his enterprising classmates atop a pile of lumber on a freight car. A series of engineering and teaching assignments followed graduation from the engineer school as well as foreign tours of duty where he put his linguistic talents to good use. Griffiths worked with the military projects in Galveston from January, 1941 until March, 1942. Late in the war, he moved to England as assistant to the engineer of Supreme Headquarters Allied Expeditionary Forces (SHAEF) and as chief of transportation with responsibility for the detailed studies and planning for the artificial harbors for the invasion of France. Griffiths would return to Galveston in July, 1945 for a two-year stint as district engineer.²⁵

Designing runways to bear the weight of new and heavier planes posed an unprecedented challenge to the Corps of Engineers and represented one of its greatest technical accomplishments. Due to the novelty of paved airfield construction, no regulations or criteria existed. Without guidelines, the engineers were forced to arrive at many decisions arbitrarily, relying heavily on applied judgment. Once the choice had been made to pave Ellington with concrete, the question arose of what thickness to use. Tom Elam, chief of the Design Branch, discussed this problem with a material salesman one day. The salesman, a practical man, asked Elam if the street in front of the Santa Fe Building would support the aircraft to be used. Elam responded affirmatively. Together they decided that the street, paved with brick and asphaltic concrete, would



Paving parking apron at air force base

be equivalent in strength to about 6 inches of concrete. In that fashion, the thickness of the Ellington runway pavements was determined.²⁶

The concentrated effort for airfield construction continued throughout 1941 and was greatly accelerated after the United States entered the war in December. In 1942, many completely new airfield installations were authorized: Matagorda, Eagle Pass, San Angelo, Blackland, Big Spring, Bergstrom Army Air Field at Austin, Aloe at Victoria, Galveston, Palacios, Bryan, and Brownsville.

On December 1, 1942, revision of the Southwestern Division to conform to the boundaries of the Eighth Service Command enlarged the military boundaries of the Galveston District to encompass a large part of Louisiana. Included among the Army Air Force stations transferred at that time were Harding Field at Baton Rouge, Hammond, Moissant at New Orleans, DeRidder, and Lake Charles.²⁷

By 1943, in just a little over two years, the district had to its credit construction of nineteen new army air fields, complete with cantonment and airdrome facilities, plus expansion of and supplementary construction on nine more fields at a cost of approximately \$158.4 million. An extraordinary accomplishment in itself, the airfield construction comprised just the tip of the iceberg as the final months of 1941 approached.

Engineers Shoulder the Entire Load

While the strengths of the Corps of Engineers organization were being put to test during the first year of the airfield program, the move to transfer all military construction from the Quartermaster to the Corps of Engineers was gaining momentum. Relying on their time-honored practice of decentralized operations, army engineer districts applied to air corps work methods that had proved successful in rivers and harbors construction. They embarked upon scientific research into the strength of runway pavements and bearing capacities of soils, setting up laboratories to investigate concrete, asphalt, and soils.

On December 1, 1941, President Roosevelt signed into law a bill providing for all army construction to be placed under the Corps of Engineers. The transfer became effective on December 16, 1941, nine days after the Japanese attack on Pearl Harbor.²⁸

Following the declaration of war, military construction increased greatly. There came calls for camouflage at stations within air frontiers, additional runways and auxiliary fields to permit wider dispersal of planes, intermediate general depots to regulate flow of supplies to coastal ports, and special ammunition loading piers at all principal ports. Munitions work was stepped up.²⁹

One year earlier, on December 30, 1940, nine territorial construction zones had been established to correspond to the boundaries and headquarters of the nine army corps areas (later called service commands). Each was headed by a zone constructing quartermaster responsible to the quartermaster general. With the transfer of all army construction, these quartermaster construction zones became districts under the Corps of Engineers organization. The former quartermaster zone for the Eighth Army Corps Area at San Antonio became the San Antonio Engineer District, sharing construction with the Galveston District throughout the war. Military boundaries within divisions were not rigid, the work load being the determining factor in assignments.³⁰

During the first half of 1942, the Galveston District assumed a crushing load of old and new work in the face of mounting shortages of every kind. By mid-April, the district was handling construction to accommodate 65,967 men involving sixty-six active contracts at an estimated cost of \$153,589,000.³¹

Fixed-price agreements arrived at by competitive bidding had been used by the army engineers in contractual arrangements for many years. The urgency of wartime construction, however, demanded a swifter, more flexible system. During World War I, the Quartermaster had used at first cost-plus-percentage-of-cost contracts. As these proved excessive

in expense, they were superseded by cost-plus-fixed-fee contracts, which sped up construction and held down contractors' profits somewhat.

On July 2, 1940, the secretary of war was empowered to let contracts "with or without advertising"; cost-plus-percentage contracts were forbidden, but fixed-fee arrangements were permitted. Formal advertisement came to be replaced by a system of competitive negotiation, under which quotations were solicited from selected bidders. Contract procedures changed a number of times as the war ran its course.³²

Huge sums were involved. Taking bids for work on Goodfellow Air Force Base at San Angelo, Galveston's Col. Wilson G. Saville showed the bulky set of plans to a man from Brown and Root. The civilian engineer casually flipped through the plans and rendered an offhand estimate of \$25 million. Somewhat nonplussed, Saville asked if he were bidding on the plans by the pound.³³

Eventually, renegotiation was introduced to curb profiteering. The first Renegotiation Act, approved April 28, 1942, enabled the government to recover excessive profits. A San Antonio contractor is reputed to have sent the army a refund check for \$1 million even before renegotiations began.³⁴

One of the most pressing legacies the engineers acquired from the Quartermaster Corps was the urgent need for facilities to support a vital munitions industry. Construction of the San Jacinto Ordnance Depot for ammunition storage was transferred to the Galveston engineers almost immediately. A plant at the Baytown Ordnance Works to produce toluol, an organic compound used in the manufacture of TNT, was another of the district's first ordnance projects.

On January 6, 1942, Galveston received a directive to construct Dickson Gun Plant, a new installation on the Houston Ship Channel for manufacture of gun tubes. Within ten days, Griffiths was requesting priority rating for the project. Subsequently classified A-1-a, the gun factory construction entailed utilities including water supply, a distribution system, sanitary sewers, sewage disposal, storm sewers, power connections, roads, railroads, gas line, docking facilities, and fencing. Structurally, the complex called for an administration building, gun-casting shop, heat-treating shop, receiving and shipping facilities, and storage buildings. Revised specifications were required in February "to meet critical machine tool situation" and to incorporate new developments in centrifugal casting technique. The project was completed by December 20, less than a year from its initiation, and ready for the using agency, Hughes Tool Company, to move in and begin production.³⁵

Still another entirely new facility at McGregor was authorized early in March. The Bluebonnet Ordnance Works, to be operated by the National Gypsum Company, was a bomb-loading plant containing bomb-loading

lines, a booster-loading line, and an ammonium nitrate-crystallizing line. The efficiency with which this plant was erected is reflected not only in the fact that it was completed by November 15 of the same year, but also in this inspection report by an official from Washington:

It appears that the organization on this job is probably one of the best on any of the Bomb Loading Plants. Work seems to be ahead of that at any of the other plants which were started at approximately the same time. The Area Engineer appears to be on his toes and the District Engineer appears to be very much interested in the project and has decentralized as much responsibility as possible to the Area Engineer.³⁶

By summer, the district was engaged also in expanding the Texas Electric Steel Casting Company. The Baytown Ordnance Plant was equipped with protective measures such as bomb splinter walls and air raid shelters. By 1943, the district had accomplished construction totaling \$35 million in the five ordnance installations on which it worked. Further additions and modifications continued after the plants became operational.

Since camps and cantonments constituted the first major thrust of the Quartermaster's construction program, these were largely completed by the time of the transfer to the Corps of Engineers. The Galveston District performed supplementary construction at many existing ground troop stations throughout the state during the remainder of the war. A new program launched in March, 1942 resulted in construction of a three-thousand-man enemy internment camp at Huntsville, followed by two more at Mexia and Hearne. Absorbing the Louisiana military work in December, 1942, the district took on Camp Polk, LaGarde General Hospital, New Orleans Staging Area, other installations composing the New Orleans Port of Embarkation, and prisoner-of-war camps at Camp Polk, Camp Livingston, and Ruston. By the end of the year, personnel strength in the Galveston District approached four thousand employees.

Fortifications for the Gulf Coast

Although seacoast fortifications had remained continuously under the jurisdiction of the army engineers, the Galveston District had been charged with no work of this type since the early 1920s. But World War II would find German submarines entering the Gulf, sinking merchant ships, and menacing coastal ports and industries. During 1941, a fortifications section was set up, headed by Edwin A. Pearson. As preparation for his new and unfamiliar assignment, Pearson received a single sheet of paper

containing a drawing of a casemate. His first task was the sizable job of casemating Battery Hoskins at Fort Crockett to withstand an attack of five-thousand-pound naval shells. Prior to construction of the protective casemating, the projectile rooms, powder rooms, and plotting rooms were covered by concrete and earth and the two 12-inch barbette guns stood in the open.³⁷

The fortifications section designed two heavy casemates and the mechanical and electrical equipment to update the guns. Unlike the other military construction where the work was contracted out, the harbor defenses were built by a special fortifications construction force composed of district personnel. The work at Battery Hoskins was conducted under such a cloak of secrecy that at a celebration of its completion early in 1943, District Engineer Col. Wilson G. Saville announced facetiously that he was extending congratulations for something he knew nothing about.

Colonel Saville was another of the distinguished officers who led the district during the war years. His unusual life began in 1897 at Fort Sill, which was then an Indian reservation. His father was the army officer in charge of the Oklahoma reservation and Chief Geronimo stood as the young lad's godfather. Saville graduated from the November, 1918 class at West Point and attended postgraduate courses until 1920, when he resigned from the army to enter the oil business. With the introduction of geophysics, Saville recognized the importance of this new development to oil exploration and organized the first American geophysical consulting company.³⁸

The outbreak of World War II prompted Saville's return to military life. Offering his services to the army, he was assigned to Galveston where he subsequently succeeded Hewitt as district engineer early in December, 1942. After leaving Galveston late in 1943, he moved to the European Theater of Operations where he served on General Eisenhower's top level staff as chief of operations for the SHAEF Engineering Division. In August, 1945, he returned to civilian life.³⁹

In addition to casemating Battery Hoskins, the district rehabilitated other of the old batteries and constructed two identical new batteries. Battery 235 at the west end of Fort San Jacinto and Battery 236 at Fort Travis each consisted of sleeping quarters, plotting, powder, power, and projectile rooms, protection by overhead concrete and dirt, and two extremely accurate long-range 6-inch guns. Battery Mercer at Fort San Jacinto was air-conditioned, gas proofed, and turned into the Harbor Entrance Control Post to direct the defenses of Galveston. Still other provisions included some 110-foot steel observation and fire control towers on the island and on Bolivar, an antiaircraft battery at the end of the south jetty, and numerous searchlights.⁴⁰

Fortifications work extended the width of the entire Texas-Louisiana coastline. Galveston engineers designed and constructed harbor entrance defenses at Brownsville, Port Aransas, Sabine, Cameron, and Burrwood. Also, they constructed emplacements for mobile 155-mm. guns on the beaches all along the coast. Surveillance radar stations, some camouflaged to resemble water towers, and aircraft warning stations provided further protection.⁴¹

At the three Galveston forts, the district modernized and constructed accommodations for the artillery troops — barracks, mess halls, laundries, warehouses, chapels, recreation buildings, and hospitals. At Freeport, it erected a small city to house troops manning the harbor fortifications.⁴²

Although the peak of the military construction push had been passed by summer of 1943, the district continued to expand and alter existing facilities and to undertake new construction to meet continuously changing and specialized training needs. Men who had been deferred from military service for the critical construction during 1941 and 1942 now moved overseas as American efforts there intensified. If, however, construction pressures abated somewhat during this period, acute shortages of labor, materials, and supplies did not.

The district's military supply program had begun in the last quarter of 1941 with a small number of purchases of burlap, sandbags, used rail, and miscellaneous small items. The program to obtain materials and equipment used by engineer troops at home and abroad was activated in 1942. During that year, Galveston assumed production and inspection responsibilities for \$2.9 million of supplies aggregating over fifty-five thousand tons. By 1943, the program had grown tremendously to encompass production, inspection, and shipping responsibilities for a total of \$4 million worth of supplies representing a growing diversity of items. Mounting scarcities of materials and labor caused enormous problems. The Galveston District assisted the Southwestern Division Military Supply Procuring Office in persuading manufacturers to undertake contracts for items entirely outside their normal line in the midst of capacity business and almost certain difficulties.

Critical shortages inspired substitutions and ingenuity of all kinds. To cope with the lack of manpower, resourceful M. R. Royar, district personnel officer, resorted to unconventional measures:

It was so difficult to hire men that I worked out arrangements with the jail officials to release their "birds" to us for employment on our dredges. All Civil Service restrictions for employment were rescinded and the general criteria for hiring

was "Hire as long as the body is warm." Believe it or not, that is the way it actually worked as men were so scarce.⁴³

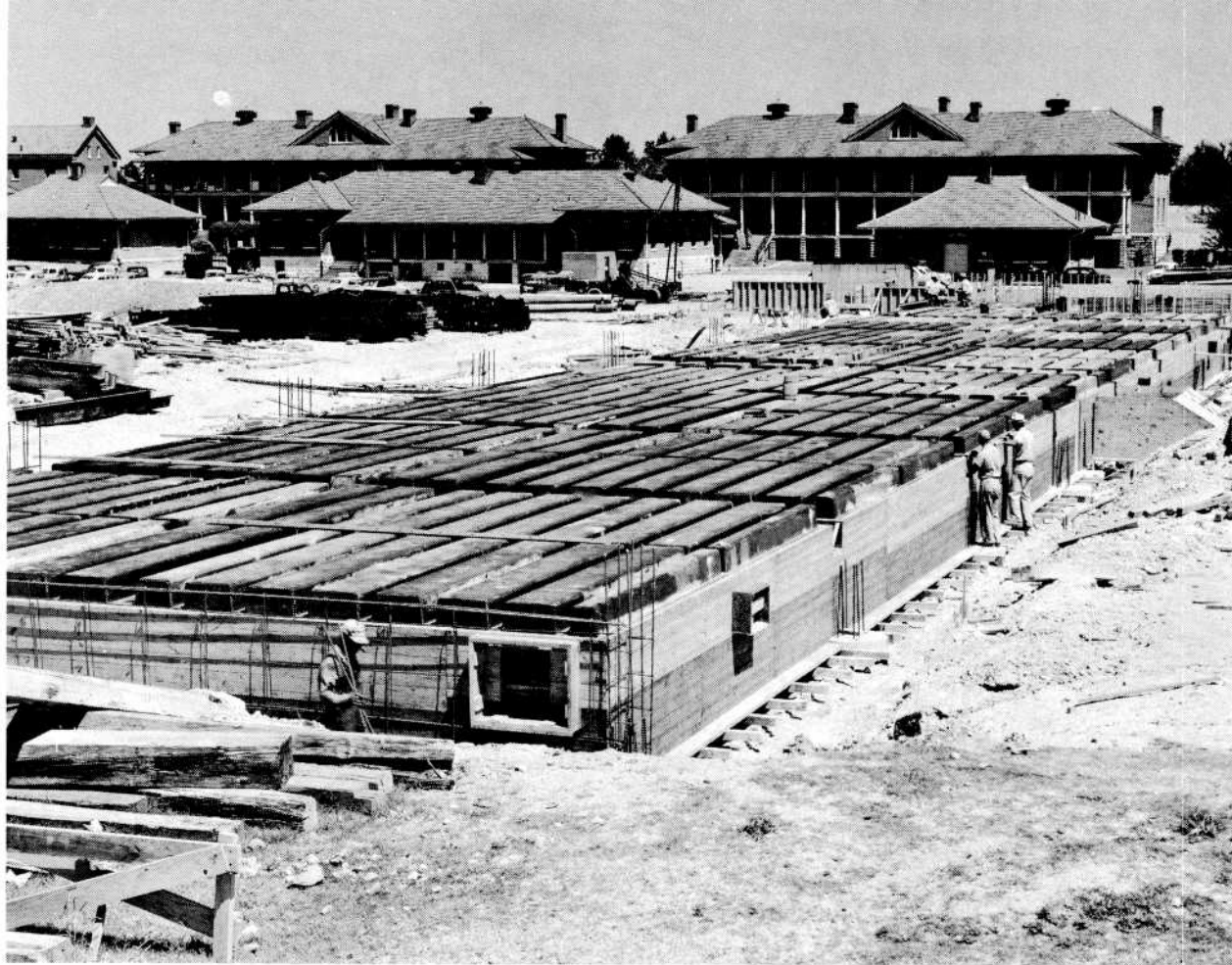
In all, Galveston District accomplished over \$225 million worth of military construction during World War II. The scope of wartime operations was enormous and the list of projects, seemingly endless. Like their counterparts in other army engineer districts, the men and women from Galveston could take immense pride in their contributions to the total war effort.

The Military Finale

Late in World War II, Galveston District began a long-term program of master planning for many army posts and air force bases in Louisiana and Texas. In existing installations, a primary objective was to replace

Lackland Air Force Base. View looking south shows barracks and 1,000-man mess hall in foreground, July 6, 1951.





Barracks construction at Fort Sam Houston

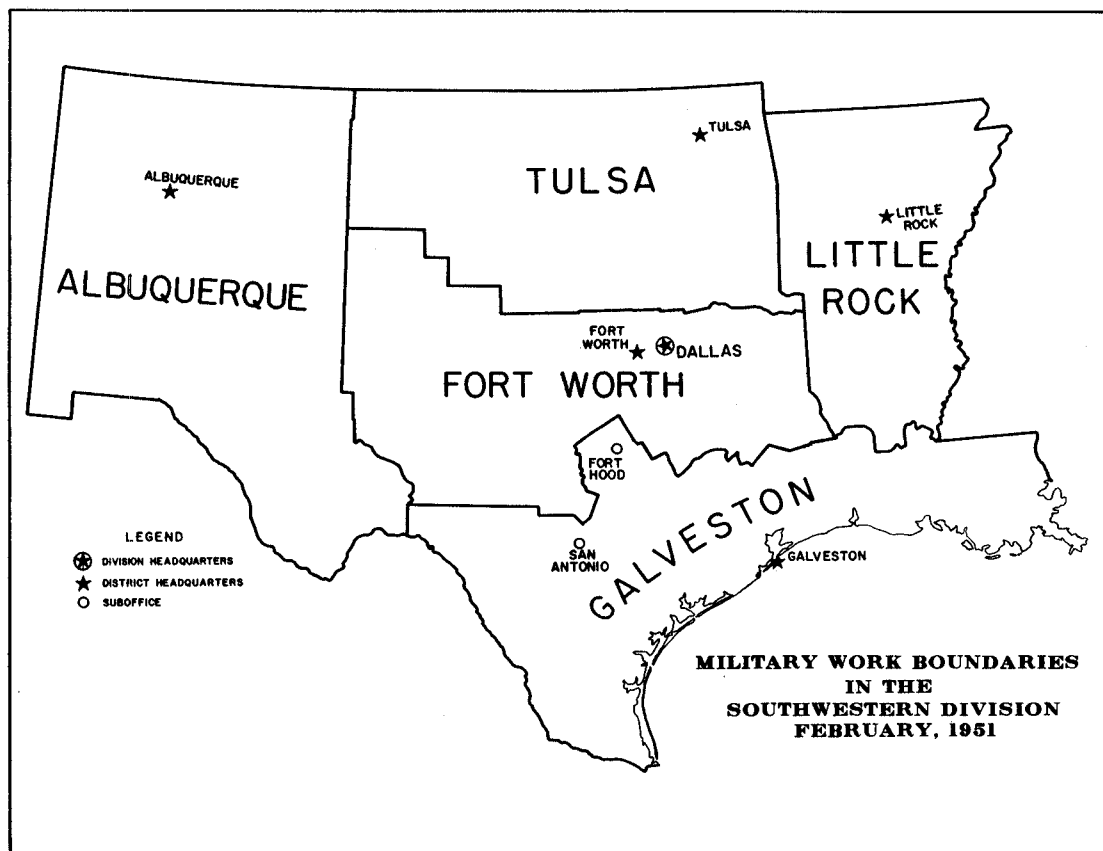
mobilization and theater-of-operations construction with superior, permanent facilities. Tremendous building programs took place during the post-war years at Bergstrom, Lackland, Randolph, Brooks, Kelly, and Carswell air force bases, Camp Polk, Camp Hood, and Fort Sam Houston.

This military work, together with what remained of the fortifications work, was assigned to a general engineering section in the Design Branch. Coordination of planning, design, and specifications for all military projects was handled by an architectural section which included among its responsibilities construction of hospitals for the Veterans Administration. The district awarded contracts for VA hospitals in Houston and Dallas late in 1946. Other projects undertaken after the war included adding new facilities at national cemeteries, constructing armories for the National Guard and the Organized Reserve Corps, and leasing scores of offices for military recruiting services. An extensive disposal program was handled for hundreds of properties classified as surplus after the war. In one instance, the Corps clashed with local ranchers who disregarded warnings to remove their grazing cattle from the open pasture before the Fourth Army detonated shells remaining from the deactivated bombing range.⁴⁴

With the outbreak of hostilities in Korea in June of 1950, the district was once again off and running. The Design Branch gathered plans for existing installations and the Real Estate Division busied itself recapturing deactivated sites.⁴⁵ A number of former bases (Laughlin, Harlingen, Laredo, Foster, and Lake Charles) had to be built almost anew. Many other installations became scenes of large-scale rehabilitation, expansion, and new construction. Military work took priority, pulling many district employees off their work on civil projects. Personnel strength, 485 at the beginning of June, grew rapidly, especially after February of the following year, to 737 by the end of September, 1951.

Toward the end of 1950, intervention by the Chinese Communists in Korea and the presidential declaration of a national emergency in the United States intensified military construction efforts. A portion of Galveston's military work in Upper Texas was ordered transferred to the ten-month-old Fort Worth District effective February 1, 1951.⁴⁶ Soon thereafter, military activities increased dramatically. By August 18, 1951, Galveston District was administering 116 active contracts for construction, services, and equipment.

Once again, to meet the urgent pressures of war, all work was done under contract. With the experiences of World War II under its belt, the





Constructing sewage treatment plant at Foster Air Force Base in Victoria

Corps approached contractual arrangements more stringently, resuming its former practice based on fixed-price agreements. For rehabilitation at San Marcos Air Force Base, several days were spent negotiating eleven hundred bid items. Once the job was underway, the contractor pushed so energetically that during a single two-week period, he accomplished \$1 million worth of work.⁴⁷

A huge training center for air force inductees, Lackland suffered an acute shortage of accommodations. At first, tents with folding cots were used. As the situation grew steadily more critical, the men were reduced to sleeping in shifts on the cots. Mothers voiced their indignant complaints over these arrangements for their sons, stimulating remedial authorization for a \$5 million rush job. Design Branch architects plunged into the project on an around-the-clock basis and, within 150 days, the Construction Division had completed fine new barracks and a one-thousand-man mess, resplendent with stainless steel kitchen equipment.⁴⁸

An important and challenging project acquired by the district during the Korean Conflict was the Michoud Ordnance Plant in Louisiana. Chrysler operated this facility to produce engines for armored tanks. In spring, 1951, work began on an engine test cell building. Because of foundation soil conditions at New Orleans, the reinforced concrete structure had to be built upon wooden piling, 70 to 80 feet long.⁴⁹

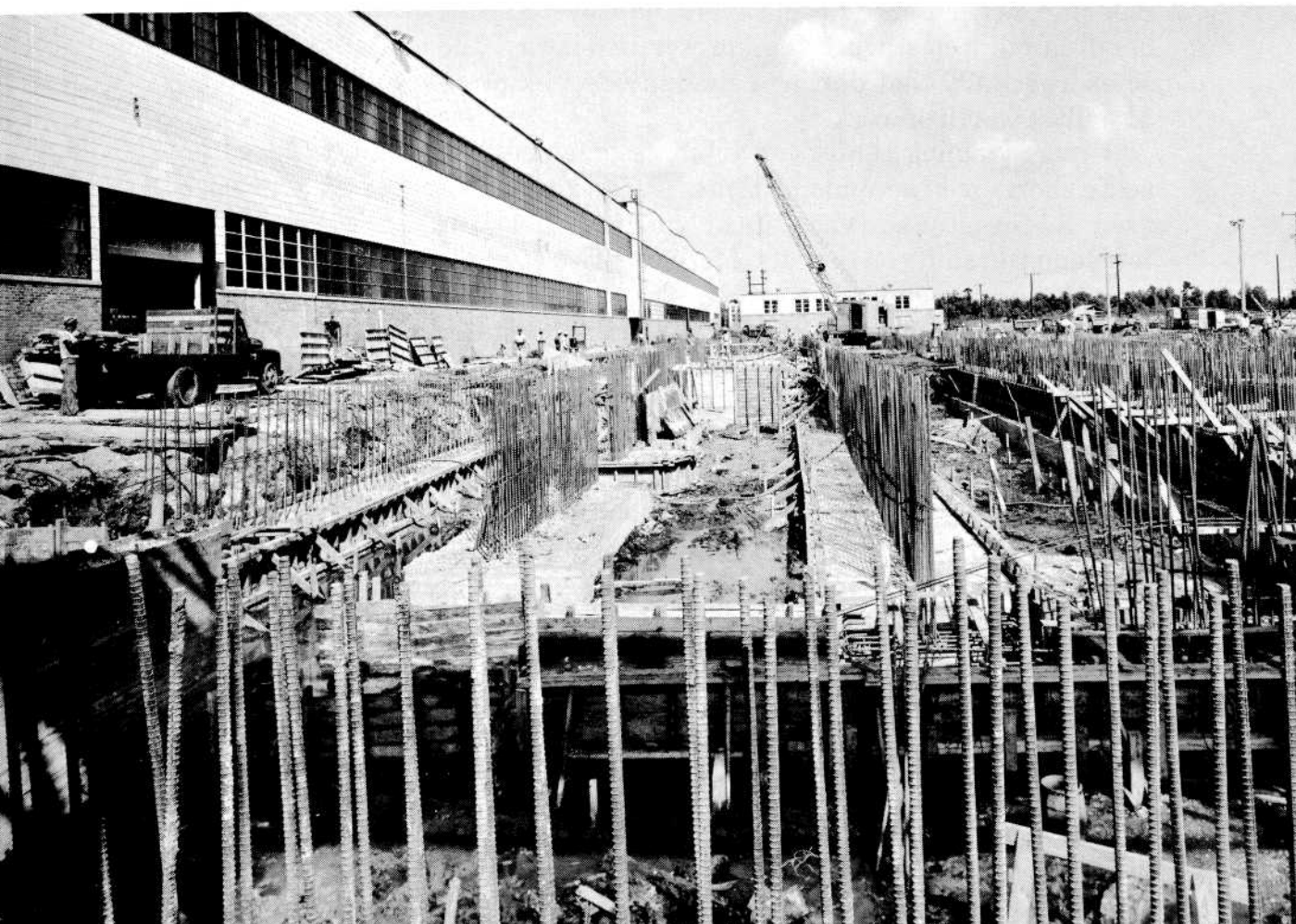
The main plant building encompassed 40 acres beneath one roof. Its size was so gigantic that personnel resorted to using rubber-tired roller skates

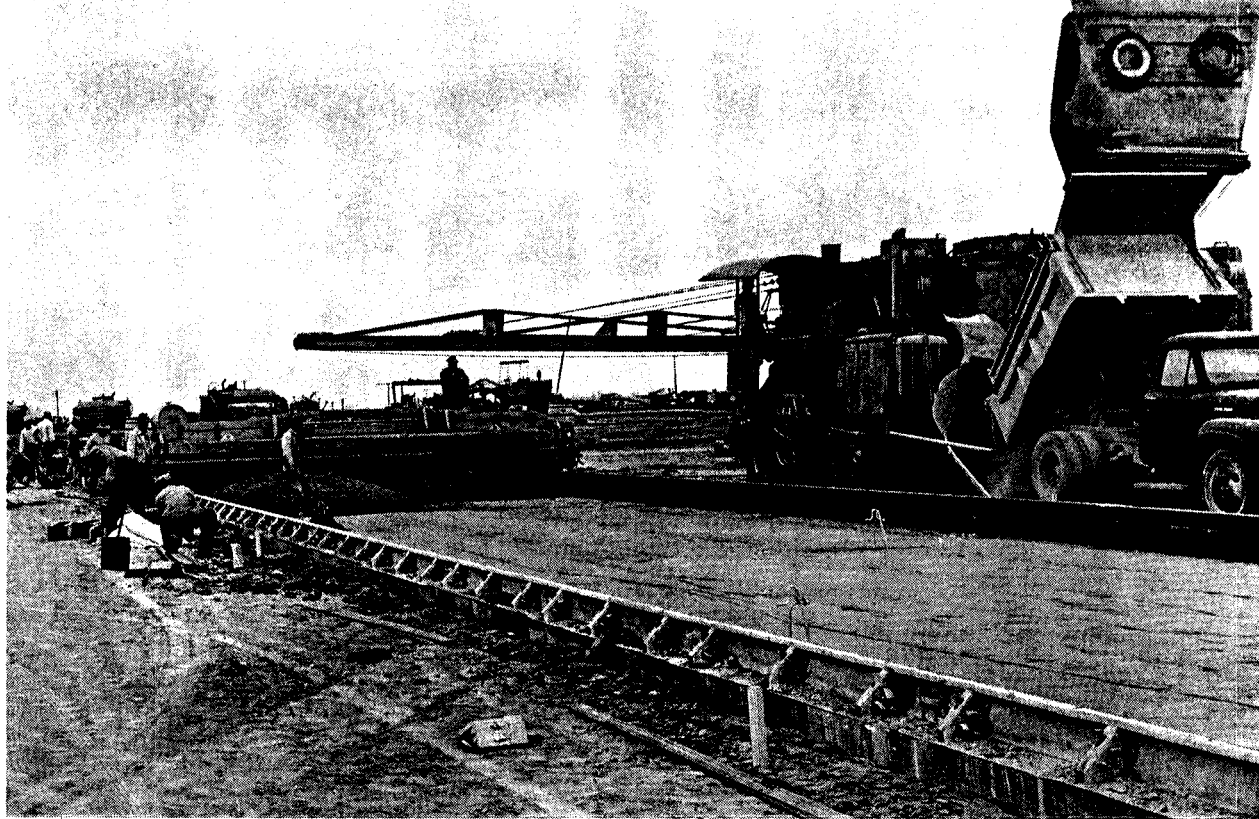
and motorcycles with sidecars to move around inside the building. Predating the Houston Astrodome by more than a decade, the Corps of Engineers air-conditioned this gargantuan expanse of space. The task required a power plant containing seven eleven-hundred-ton compressors and a two-story high, twenty-two-hundred-ton compressor. Throughout the 1950s, the district continued to construct improvements totaling millions of dollars at the Michoud plant.⁵⁰

Two new bases were developed to support the atomic missile program: Gray Air Force Base near Fort Hood and Medina Base near San Antonio. Construction at both bases involved igloos for missile storage as well as housing and other amenities. The district built special roads to connect storage facilities at Medina Base with Kelly Air Field.⁵¹

Early in the Korean Conflict, construction began on a system of border defense for the Air Force. To detect incoming planes from the Gulf as well as from the Texas-Mexican border, several central and many satellite radar stations were located on high ground from El Paso to New Orleans. The district performed work on this aircraft warning system throughout the decade.⁵²

Footings for walls of engine test cell building at Michoud Ordnance Plant in New Orleans, August 29, 1951

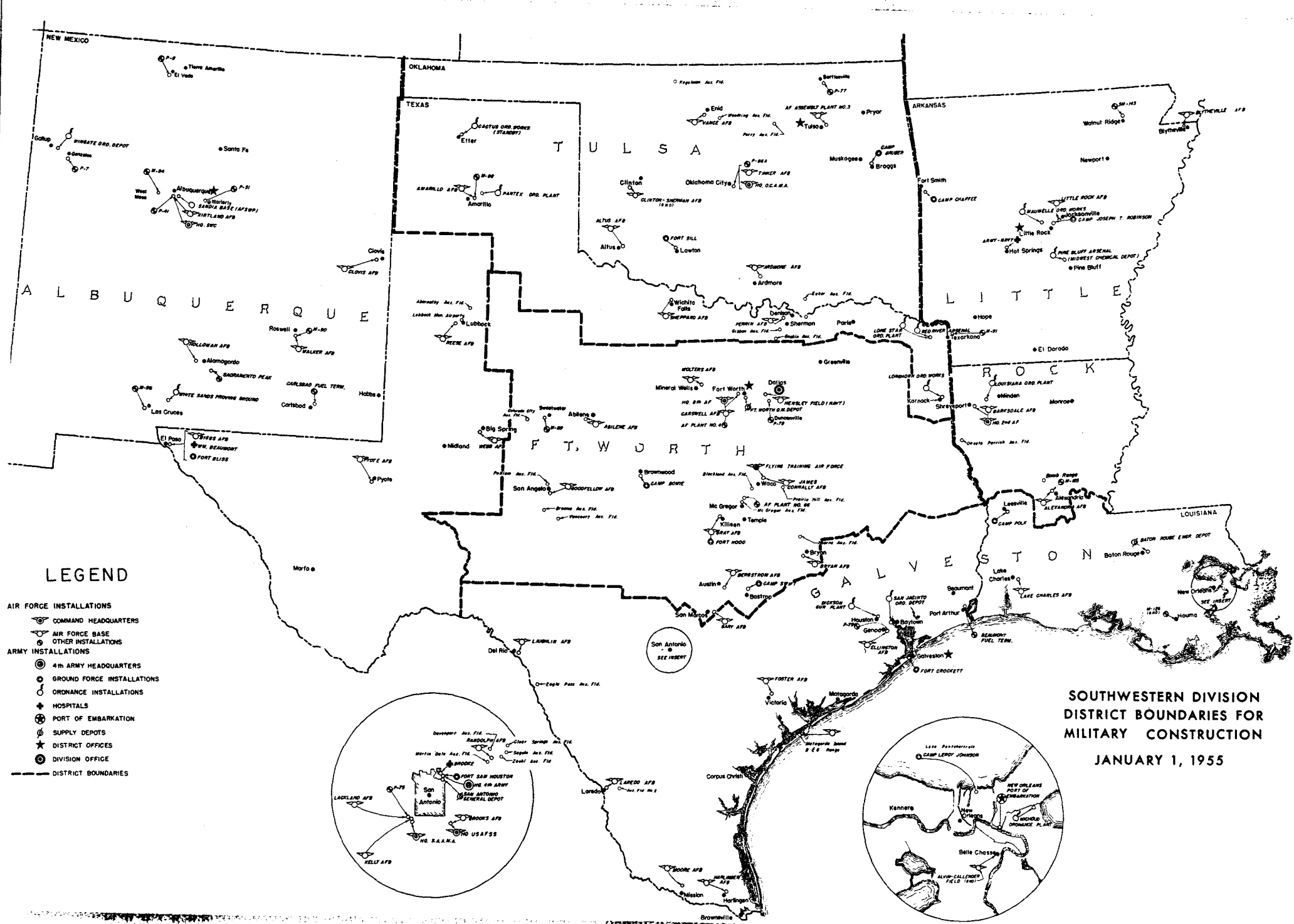


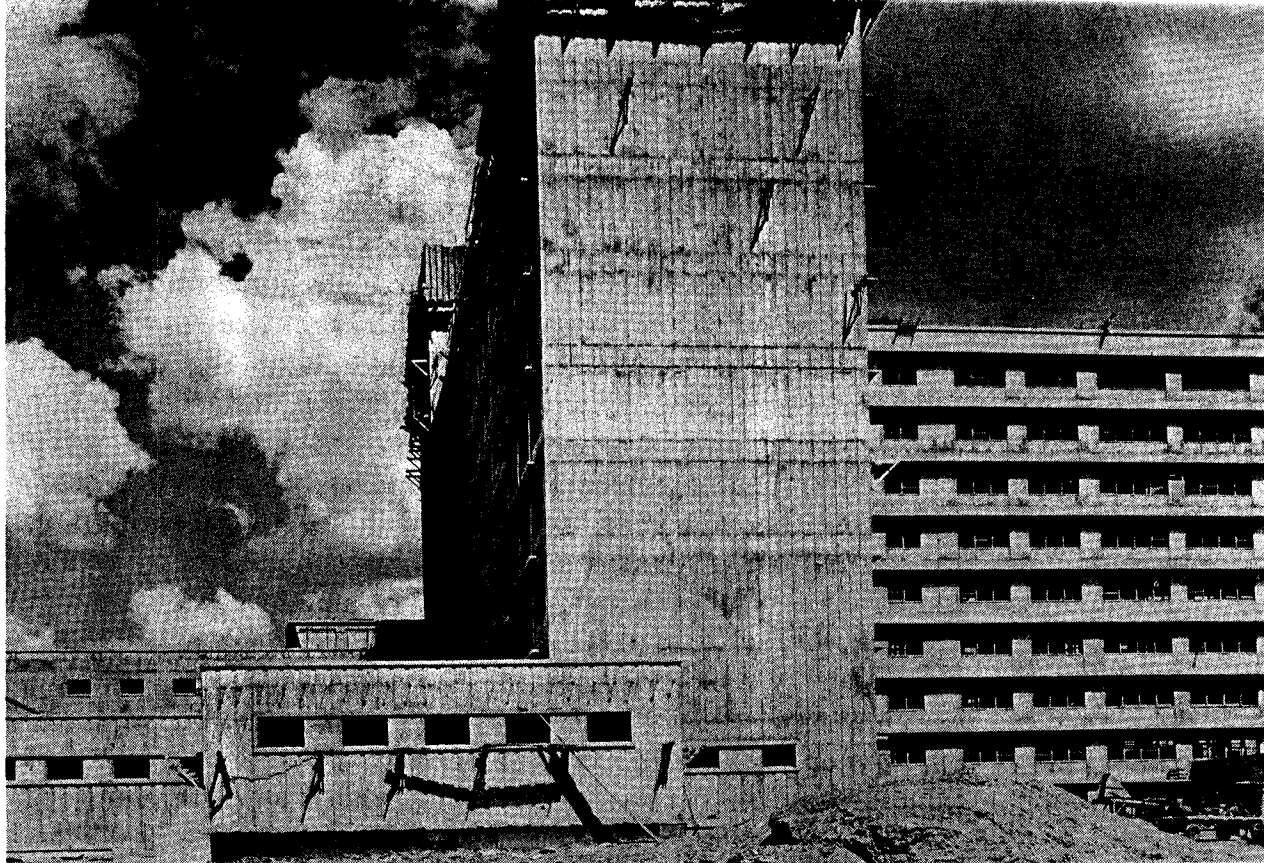


Building runways at Lake Charles Air Force Base to accommodate jet bombers

Ground force maneuvers by the Fourth Army Second Division, stationed at Fort Hood, involved the Galveston District in an activity of a different nature. Designated "Operation Longhorn," the maneuvers required the already very busy Real Estate Division to obtain permits for the soldiers to cross a sizable amount of land in Central Texas. Negotiators hired to obtain the permits issued assurances that any property damages would be repaired. After the first maneuvers, some landowners were understandably reluctant to subject their property to a repeat performance. Opposition became so staunch that finally the entire operation was moved to Louisiana. There, the Real Estate Division acquired temporary permits for 7 million acres, almost the entire western half of the state up to the Arkansas border, and rights to cross the Red River. After the maneuvers came restoration of the river banks and settlement of damages. Among the less routine claims was that of one man who demanded \$10,000 for a single pecan tree that had been picked clean by the troops.⁵³

Generally, construction during the Korean Conflict improved upon that of World War II, using better materials, such as reinforced concrete and masonry, and meeting higher technical qualifications. Airfield design had come a long way in ten years. New runways, 11,000 by 300 feet, constructed at Kelly and Lake Charles, featured 2-foot thicknesses of pavement. Numerous airfields were built to accommodate heavy bombers.





Wilford Hall, under construction at Lackland Air Force Base

The newly constructed barracks at Lackland afforded a palatial contrast to those of World War II vintage. Other unusual accomplishments included a security service headquarters building at Kelly and a celestial navigation training building resembling a planetarium at Ellington.⁵⁴

After the signing of the armistice in 1953, the Galveston District continued to carry a heavy military load. An interesting foundation problem persisted at the bases around San Antonio and Austin. Along the Balcones fault that was formed more than 70 million years ago, the top layer of Edward limestone had long since weathered out, leaving a spongy black clay. So highly reactive to moisture conditions that the ground soil literally “heaved,” this clay caused considerable trouble. To overcome this handicap, huge drilled and underreamed footings were built, based below the zone of seasonal moisture variation sometimes as deep as 93 feet, to provide foundations for large structures like the Kelly security building.

The district built many such buildings. The Special Air Materiel Command Warehouse at Kelly covered 480,000 square feet. A method of vacuum processing was used to cure the concrete in mass-producing the 2,880 “Texas size” panels, 5 by 33 feet, for the warehouse roof. Still another highlight of this postwar period was Wilford Hall, the ultimate in air force hospital facilities, at Lackland. This five-hundred-bed facility, erected between 1954 and 1957, was the first architectural concrete structure of its size in the vicinity.⁵⁵

Meanwhile, at nearby Brooks Air Force Base, construction of the School of Aviation Medicine (Aerospace Medical Center) entailed unique features never built before or since. A brick research laboratory building housed sound attenuation rooms designed to simulate conditions in outer space. To achieve maximum sound absorption, the contractor (Farnsworth and Chambers) utilized soft, acoustical materials and developed a wall configuration incorporating wedge-shaped projections that baffled sound. A radioactive area intended for study of every possible radiation problem that might be encountered in space presented more complicated design challenges. A mechanical hand operated by remote control and a protective periscope device were among the designs developed by the contractor in cooperation with the Southwest Research Institute for this high energy area.⁵⁶

By 1959, the district had added to its military construction Nike Guided Missile facilities at the Bergstrom Defense Area. Work progressed as usual for the next couple of years until a memorable Good Friday in 1961, when personnel were summoned to the Santa Fe Building and informed that Galveston would be relieved of its military assignment and possibly made an operational district only. Orders dated May 22, 1961 followed, transferring all responsibilities for military construction and military real estate in the Southwestern Division to Fort Worth and Albuquerque districts as of July 1, 1961. Removal of the military mission cut personnel strength drastically. Subsequent organizational readjustments included conversion of the Construction Division into a branch under the Operations Division. In 1967, this unit became the Construction-Operations Division.⁵⁷

Almost coinciding with the transfer of the military mission, civil defense was placed under the secretary of defense and a National Fallout Shelter Program established as a national objective in May of 1961. Galveston District set up a Civil Defense Support Branch to institute this program in the coastal area from Brownsville to the Sabine. This branch trained architect-engineers to identify and evaluate structures capable of protecting against radiation fallout, designated shelter areas with appropriate signs, supervised surveys to locate potential shelters for communication facilities in the National Emergency Broadcast Net, and assisted municipal authorities in preparing public information. The district continued work on this program well into the 1960s.

Galveston regained a fraction of its former military work on September 1, 1972 with return of the real estate function: acquisition, leasing, and disposal of property for military and postal service facilities within an area corresponding roughly to the civil boundaries. Relieved of the postal work on June 30, 1973, the district continues to manage the remaining military

work, consisting largely of providing recruiting facilities for all four branches of the armed forces and furnishing housing for army and air force recruiting personnel. Since the decision to phase out Ellington Air Force Base and Matagorda Island Bombing Range was announced in November, 1974, Corps real estate personnel have been disposing of land, buildings, and personal property at both installations.

Pride in the district's accomplishments during the years of its military mission runs justifiably high. Although the pace, diversity, and magnitude of military construction activities defy any palatable form of inclusive description, the chief of the Construction Division during the 1950s, Wilbur Laird, summed them up rather well. Recalling the pool of engineering talent built up in Galveston during that time, he submits, "We had a group that could have built anything in the world."

Notes to Chapter 7

¹ Earl Wesley Fornell, *The Galveston Era: The Texas Crescent on the Eve of Secession* (Austin: University of Texas Press, 1961), p. 26.

² Board of Engineers (Col. Henry L. Abbot, Col. Henry M. Robert, Lt. Col. G. L. Gillespie, and Maj. C. W. Raymond) to Brig. Gen. W. P. Craighill, 12 July 1895, Carton 27, File no. 660.2, (Gen.) Artillery & Torpedo Defenses of Galveston, 1895-1920, Galveston District Fortification Files (GDFF) (hereafter cited as Board to Craighill).

³ *Annual Report of the Chief of Engineers to the Secretary of War for the Year 1868* (Washington, D.C.: Government Printing Office, 1868), p. 505 (hereafter cited as *ARCE*, followed by date of fiscal year covered in report).

⁴ Board to Craighill; *ARCE*, 1880, p. 51.

⁵ *ARCE*, 1900, p. 6; Board to Craighill.

⁶ *ARCE*, 1896, p. 524; *ARCE*, 1898, p. 765; *ARCE*, 1897, pp. 741, 19-20.

⁷ *ARCE*, 1898, pp. 10, 29, 769-70; *Encyclopaedia Britannica*, 14th ed., s.v. "Spanish-American War."

⁸ Brig. Gen. John M. Wilson to Lt. C. S. Riché, 19 April 1898, Carton 27, File no. 660/171, (Gen.) Mines, Torpedoes, & Batteries, 1898-1911, GDFF; *ARCE*, 1895, p. 6; *ARCE*, 1899, pp. 964-65.

⁹ In accordance with custom pertaining to all fixed armament, the original batteries at Fort San Jacinto were named after valiant soldiers: Julius Heileman (two 10-inch breech-loading rifles), Hugh Mercer (eight 12-inch mortars), John Hogan (two 4.7-inch rapid-fire guns), and George Croghan (two 15-pounder rapid-fire guns). *Galveston Tribune*, 17 October 1923; H.R. Doc. 132, 56th Cong., 2d sess. (1900), p. 4.

¹⁰ Batteries at Fort Crockett were: Wade Hampton (two 10-inch breech-loading rifles), George Izard (eight 12-inch mortars), and Jacint Laval (two 15-pounder rapid-fire guns). At Fort Travis, batteries Thomas Davis and Rudolph Ernst contained two 8-inch breech-loading rifles and three 15-pounder rapid-fire guns. *Galveston Tribune*, 17 October 1923; H.R. Doc. 132, 56th Cong., 2d sess. (1900), p. 4.

¹¹ *ARCE*, 1901, p. 31.

¹² H.R. Doc. 132, 56th Cong., 2d sess. (1900), p. 4; *ARCE*, 1901, p. 32.

¹³ *Galveston Tribune*, 17 October 1923.

¹⁴ Battery Hoskins was named in memory of Second Lt. Leonard C. Hoskins, who died in action during 1918. It housed two 12-inch barbette breech-loading rifles. Battery Kimble honored Maj. Edwin R. Kimble of Galveston who also lost his life overseas during World War I. *Galveston Daily News*, 10 June 1921; *Galveston Tribune*, 17 October 1923.

¹⁵ Lenore Fine and Jesse A. Remington, *The Corps of Engineers: Construction in the United States*, United States Army in World War II (Washington, D.C.: United States Army, 1972), p. 4 (hereafter cited as Fine & Remington, *Construction in the United States*).

¹⁶ *Ibid.*, p. 89.

¹⁷ *Ibid.*, pp. 123, 89.

¹⁸ *Ibid.*, pp. 252, 255.

¹⁹ Interview with Jonathan L. Ransom, 3 October 1975, provided considerable background for the discussion of airfields in this chapter.

²⁰ Lt. Col. S. L. Scott, Southwestern Division Engineer, to Office of the Chief of Engineers (OCE), 28 January 1941, Engineer Historical Division (EHD) files, Baltimore.

²¹ Office of Inspector General, "Report of Special Inspection of Emergency Construction at Ellington Field, Texas," 29 November 1940, EHD (hereafter cited as IG, "Report of Special Inspection"); OCE, *War Construction, Monthly Progress Report*, no. 60, 31 December 1942, EHD.

²² IG, "Report of Special Inspection."

- ²³ *Airport Drainage* (Middletown, Ohio: Armco Drainage and Metal Products, Inc., 1948).
- ²⁴ U.S. Military Academy Association of Graduates, *Assembly*, Fall 1964.
- ²⁵ *Ibid.*, Fall 1969.
- ²⁶ Ransom interview.
- ²⁷ Organization of the Army Air Forces occurred in June, 1941. Fine & Remington, *Construction in the United States*, p. 457.
- ²⁸ *Ibid.*, pp. 472, 476.
- ²⁹ *Ibid.*, p. 479.
- ³⁰ *Ibid.*, pp. 263, 487; Memo, Maj. Gen. E. Reybold, OCE, to Division Engineers, 27 October 1942, File no. SPEGC, EHD.
- ³¹ OCE, *Progress of War Construction*, no. 49, 15 April 1942, EHD.
- ³² Fine & Remington, *Construction in the United States*, pp. 119, 574.
- ³³ Ransom interview.
- ³⁴ Fine & Remington, *Construction in the United States*, p. 579; Telephone interview with Wilbur Laird, 11 December 1975.
- ³⁵ Lt. Col. D. W. Griffiths to Chief of Engineers, "Request for Priority Rating for New Project," 16 January 1942, EHD; Maj. H. B. Sheets, Ordnance Dept., to F. R. Creedon, OCE Construction Division, "Revised Information Required for Negotiation of Collateral Contract Changes," 18 February 1942, EHD; OCE, *War Construction, Monthly Progress Report*, no. 60, 31 December 1942, EHD.
- ³⁶ G. F. Widmyer, OCE, to Creedon, "Inspection Trip — Bluebonnet and Pantex Ordnance Plants," 4 May 1942, EHD.
- ³⁷ Interview with Edwin A. Pearson, 11 April 1975, furnished an invaluable picture of Galveston District's military activities and provided all the details regarding fortifications work that appear in this chapter.
- ³⁸ U.S. Military Academy Association of Graduates, *Assembly*, October 1954.
- ³⁹ *Ibid.*
- ⁴⁰ Pearson interview.
- ⁴¹ *Ibid.*
- ⁴² *Ibid.*
- ⁴³ M. R. Royar to author, 4 December 1975.
- ⁴⁴ Laird interview.
- ⁴⁵ Telephone interview with Darrell Jackson, 23 January 1976. Military real estate work began in 1942 out of Dallas. Part of the Southwestern Division Real Estate Office was located in Houston during the following year. In 1950, about the time the Fort Worth District was created, this Houston office was closed and moved to Galveston.
- ⁴⁶ OCE, General Order (GO) 3, 25 January 1951.
- ⁴⁷ Laird interview.
- ⁴⁸ *Ibid.*
- ⁴⁹ *Ibid.*
- ⁵⁰ Interview with Bruce Walters, 6 January 1976; Laird interview.
- ⁵¹ Pearson interview.
- ⁵² *Ibid.*
- ⁵³ Walters interview.
- ⁵⁴ Laird interview.
- ⁵⁵ W. H. White, "Thin-Shell, Precast Concrete Roof Panels Utilized in Kelly AFB Warehouse Project," *Texas Contractor* 65 (3 May 1955): 26-27; Telephone interview with Gerald Lyda, 19 December 1975.
- ⁵⁶ Lyda interview.
- ⁵⁷ OCE, GO 17, 22 May 1961; *Galveston District Organization Chart*, 1 January 1962; *Ibid.*, 1 August 1967.